The Effects of Animal Narratives on Learning

Honors Thesis

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Abstract

Previous studies show that the degree to which an individual is transported into a narrative influences the way the story affects their attitudes and beliefs. This study looks in particular at how individuals learn about animals through animal narratives. We manipulated visualization, anthropomorphism, story type (fiction/non-fiction), and factuality to determine how these factors influence both transportation and learning. Our findings determined that there was no significant influence of visualization on the degree of transportation experienced by participants ($p>.05$). Results found that anthropomorphic stories were less transportive than non-anthropomorphic stories. Data also concluded that participants more highly transported answer more questions correctly, implying a higher rate of learning.

Introduction

Individuals learn about animals in a variety of ways. They encounter messages in formal classroom settings, through personal experience, and in the media. Each message presents different information that they must take in and process. What they learn from these messages and how they learn it plays an important role in their daily interactions with animals.

It is critical that people learn correct information about animals since incorrect or misinformation can have a variety of consequences. Individuals who are not knowledgeable about animals may choose the wrong pet for their family and be unable to care for it. They may also inadvertently do things that damage the environment. The effects of misinformation are seen in the "Nemo Effect", a term that was coined in a CNN article (2004), after the release of the movie Finding Nemo. People who watched the movie began freeing their fish, following the example of the film. Large populations of non-native species began appearing in oceans around the world; having an impact on the ecosystem, ('Releasing Nemo' may harm local fish species, 2004.) A second, more recent example, of how incorrect information can lead to negative consequences is the death of Steve Irwin. After his accident, misinformation about the level of threat posed by stingrays led to many of them being killed (Associated Press, 2006).

Since it is important that individuals get the correct information, it is essential to consider that stories and narratives can influence how an individual learns about animals. Both fictional and factual stories have the ability to present information to an audience, therefore both need to be considered. Fictional stories in particular may have a greater impact on learning because individuals often think less critically when encountering these

narratives than when they are processing persuasive messages. (Green, Garst & Brock, 2002)

In the past, fictional narrative has been overlooked by researchers in favor of exploring rhetoric or persuasive messages (Green, Garst & Brock, 2004). However, in recent years narratives have attracted more interest as a possible way of altering beliefs. Since fictional stories are not traditionally thought of as teaching tools, it is important to look closely at the possibilities they hold for affecting learning. Fiction presents two options. The first is that despite its lack of reality, fiction is still capable of teaching fact. Green, Garst and Brock (2004) use the example of Sesame Street. This program is a work of fiction, yet it still teaches children about numbers and letters, as well as other factual information.

Fictional narratives may also present incorrect or distorted information in addition to the factual knowledge it conveys. Many medical sitcoms, for example, present medicine that is not true to life. Although they do present medicine realistically and with some degree of truth, the outcomes on the show are often different from what they would be in real life. Crime shows like CSI present similar problems. They show scientific tests being completed in hours when in reality these tests would take weeks to finish. Although there may be some truth to the information, the viewing public is not getting complete facts; rather they receive a distorted or misrepresented version of the truth. (Green, Garst & Brock, 2004).

The concept of transportation has been found to be a particularly important component in the way an individual learns from stories. Transportation the engagement of individuals in a story to the point where they can create images in their head and they

feel as though they are a part of the narrative. When people are transported by a story, they are more likely to take on the attitudes and beliefs that are found in the story, thus enhancing learning. (Green & Brock, 2002).

Overall, this study is trying to determine how narratives involving animals, both fictional and non-fictional, affect an individual's knowledge and learning about that animal. In order to explore this idea further, we set up an experiment where participants listened to a series of animal narratives and answered questions regarding the information they heard. Half of the stories were fiction and half non-fiction. The stories were manipulated to create different versions, some contain true information and others contain false information. By seeing how individuals answered questions based upon the story, they heard and through our measures of transportation, we can describe how narratives influence learning. This information and awareness of how people learn from media, whether good or bad, could help in designing media and narratives with positive messages instead of proliferating misinformation.

Literature Review

How People Learn about Animals

In order to look at narratives affect on people's beliefs about animals, first we look at how people learn about animals in general. Obtaining information from formal education, personal experience, and media sources, each has their own benefits and limitations. Formal education is the most obvious and structured way learning takes place. A study done measuring peoples' attitudes and beliefs about bottlenose dolphins showed that initially "participants depicted relatively simple concept maps, which grew

progressively more sophisticated with increasing age and educational exposure" (Barney, Mintzes, & Yen, 2005). Younger subjects were able to identify concepts of basic anatomy and environment whereas older, more educated participants knew a great deal about the physiology and ecosystem of the animals. These findings indicate that higher levels of education are related to knowledge, attitudes, and actions. (Barney, Mintzes, & Yen, 2005).

Although there has not been much research done on the subject, personal experience may also play a role in what people know about animals. If someone was once a pet owner, they may be better informed about what is needed to take care of a pet than someone who has never cared for an animal. However, this learning method may offer only limited possibilities in terms of the information that can be gained, since only certain species of animals are kept as pets.

The media may also play a role in how people learn about animals. Once again, there is not much literature discussing how animals in the media affect learning; however, media images of animals would be one of the most widely accessible forms of information for individuals to access. Similar to the problem discussed earlier, depictions of animals may be distorted (cartoons for instance), so even if people are learning about animals through the media they may not be getting entirely correct information.

Anthropomorphism

Anthropomorphism is the "attribution of human mental states (thoughts, feelings, motivations, and beliefs) to non-human animals" (Serpell, 2003). The anthropomorphism of animals occurs in many contexts. Darwin himself used adjectives that described animals through associations with human characteristics, in his naturalistic writings.

Until fairly recently animal behaviorists looked at animals in a more instinctive way, as creatures with impulses, but no conscious thoughts that would liken them to humans. Recently there has been a shift and more behaviorists are beginning to see the validity in classifying some animal behaviors in an anthropomorphic way. This has lead to discussions about different types of anthropomorphism and their effects. Wynne (2004) talks about two types of anthropomorphism. The first is "naïve anthropomorphism", which is what would lead a small child to talk to their pet rabbit. The second is "critical anthropomorphism", which is the more complex behavioral patterns that form the basis for research questions. The media conveys naïve anthropomorphism, since this is what connects with audiences. Therefore, naïve anthropomorphism is the primary concern when looking at narratives.

If we return to the example of Finding Nemo, we can see naive anthropomorphism. In the movie, the primary characters are two clown fish, a father and a son. In nature once the female lays thousands of eggs, the newly hatched fish are on their own. They do not remain within the care and protection of their parents. However, by creating this familiar family dynamic, the film appealed to a broader audience than a documentary film or a movie depicting the realistic situation.

Anthropomorphism is important to our discussion on narratives because it has the potential to effect transportation as well. Individuals who are able to identify with situations and conflicts within a narrative are more likely to be transported (Green & Brock, 2000). If a story contains anthropomorphic animals, they should be more identifiable due to the assignment of human traits. We should then hypothesize that

narratives containing more anthropomorphized animal characters will create higher degrees of transportation than those with less or no anthropomorphism.

Transportation

While the way that people learn about animals and the way animals are portrayed in narratives are necessary, it is essential to consider the narrative itself and the impacts that it has on the reader.

Transportation, the "integrative melding of attention, imagery and feelings, focused on story events" (Green & Brock 2000), is significant not only for its potential entertainment value, but as a vehicle for changing beliefs and increasing learning. Studies have shown that transportation in narratives can lead to changes in real-life beliefs (Green, 2006). These examinations have looked at how the degree of transportedness that an individual experiences affects their attitudes relating to the story in addition to their feelings towards the primary characters in the narratives. In relation to our study, this would indicate that the more an individual is transported into a story, the greater the impact will be on their attitudes and beliefs towards the animals in the stories. This means that the higher the degree of transportation the more the information in the stories should shape the ideas and knowledge of the reader.

There are several factors that influence the amount of transportation and individual experiences when reading or listening to a story. First, the narrative must actually be a story that has characters and settings; recitation of facts does not have the same effect. Green (2004) tells us that if individuals are familiar with either, the characters in the narrative or the contextual storyline, or can relate to the basic conflicts and emotions in the story they are more likely to be transported than if they do not feel

these connections. As a result of the increased transportation caused by these factors, belief changes and learning take place. Readers who are transported into stories are more likely to create strong emotions in relation to the text and characters and show a greater endorsement of story related beliefs. These emotions and attachments form in addition to the feelings already present in the beginning that allowed the individual to be transported in the first place. (Green & Brock, 2000)

There are also factors that do not effect transportation and therefore have less influence on beliefs. Whether the story is fictional or not has no bearing on the amount of transportation a reader experiences. Drawing someone into a fictional story is just as easy, as the story can be based on facts. This is important to consider, especially since we are going to be looking at both fictional and non-fictional animal narratives. In fact, it has been suggested that fictional narratives may have more influence on attitudes because they are processed less critically than if they were evaluating a news story or other factual narrative. (Green, Garst & Brock, 2004)

A study on cancer communication by Green (2006) provides further information of transportation's affect on beliefs. Generally, transportation affects readers by creating a connection with the characters or making narrative events seem more like real life experiences. Transportation also produces strong attitudes because it focuses the viewer on the narrative and mentally engages them in addition to melding both affective and cognitive reactions, which tends to create stronger reactions. This combines both the emotional and rational thought, evoking an even greater response from the audience.

Transportation can be measured using a scale of how involved in the story the individual was. Green and Brock (2000) had subjects rate statements such as "I was

mentally involved in the narrative while reading it" on a scale of one to seven. These items help measure the degree of transportation that an individual encounters when reading or listening to the narrative.

All of these findings about transportation have led to the development of the Transportation-Imagery model of narrative persuasion, which explains the affects of transportation in addition to the conditions a narrative must meet in order to successfully transport its reader. The theory contains five main postulates, three of which are important to look at in this study. (Green & Brock, 2002)

The first postulate that is relevant to the study states that narrative persuasion is limited to story texts (scripts) which a) are in fact narratives b) evoke images and c) implicate readers beliefs. The first main idea of this postulate is that in order for transportation to occur it must actually be a narrative, a story with a beginning, middle and end. This may be because the way people think about narratives is different from how they would think about a persuasive message. This variation in mindset may affect the level transportation. A second idea is that language needs to be specific enough so that it creates explicit images. The more vivid the images are, the higher the degree of transportation. Lastly, the postulate states that in order for transportation to take place effectively, some beliefs of the readers must in be present in the narrative, whether it is direct or implicit. This allows them something to identify with from the beginning and provides a basis for transportation. If they identify with a part of the narrative, they will be more likely to identify with the rest of the beliefs presented. If a story contains none of the reader's beliefs, it will not be as effective at transporting. (Green & Brock, 2002)

The second postulate says that narrative persuasion (belief change) occurs to the extent that the evoked images are activated by psychological transportation. This indicates that in order to transport someone successfully, you must create images captivating enough to draw the listener in and make then forget all other thought.

An important consequence of transportation, according to Gerrig (1993), is that individuals lose access to the real world. This can occur on a physical level, so that the audience does not notice when someone enters or leaves a room. It can also occur on a psychological level where the audience becomes devoid of other thoughts. Not distracted by to-do lists or outside problems, instead they are engrossed solely in the story they are listening to. Psychological transportation suggests that while immersed in the narrative, the individual contemplates no real world facts and are therefore more likely to take on the beliefs of the narratives. (Gerrig, 1993)

The last relevant postulate of the theory is that the propensity for transportation by exposure to a given narrative account is affected by attributes of the recipient. One of these moderating attributes is imagery skill. The ability to create images from a narrative can affect the amount of transportation that an individual experiences. Therefore, those who visualize better are more likely to be more highly transported. However, the ability to visualize can be enhanced and manipulated.

One must view transportation in animal narratives to begin to understand how stories influence individual's beliefs about species and what factors of the story affect these beliefs.

Visualization

Since imagery plays a role for transportation into a story, visualization is a potential way to manipulate transportation. To make vivid and engaging imagery, the tale must not only be well written and meaningful, but the individual reading the story must also possess imagination to bring the story to life. This is easier to create with images that are more vibrant.

Vivid images are defined as being "emotionally interesting, concrete and imagery provoking and proximal in a sensory, temporal or spatial way" (Green & Brock, 2002). It is thought that the more vivid the images are the more involved a person will become in the story and the more likely it is that their beliefs will change.

The Transportation-Imagery Model specifically indicates that visualization ability affect the degree of transportation. Visualization is "the ability to manipulate or transform the image of spatial patterns into other arrangements" (Sein et al, 1993). This is an important skill when reading stories, since it is often necessary to transform the words on the page into meaningful images. However, some individuals are more apt than others. Despite differences in ability from person to person, with proper training even the unskilled can become excellent visualizers. (Sein et al., 1993). One study in particular found that competitive swimmers who underwent a psychological skills training program involving relaxation and visualization techniques showed marked improvement in three different swimming strokes. (Sheard & Golby, 2006).

While some people are more adept at visualization than others are it is a skill that can be enhanced through visualization training Shapiro (1986) found that by prepping subjects with a series of visualization exercises, the subjects who were led

through the exercise utilized more "cognitive channel capacity" to visualize the messages that they were given.

These findings indicate that participants who are trained in visualization skills prior to listening to the animal narratives should be better able to create images and be more easily transported than those who do not undergo this training. The group receiving the visualization exercise would already be in the mindset of creating images and should continue to do so when listening to the stories. Consequently, this increase in transportation should lead to increased persuasion and change of beliefs in these individuals.

Memory

The amount of transportation an individual experiences within a narrative could also affect their memory of the information presented in the story. This would make the information a belief and recalled later as truth. Memory is complicated and involves a variety of different aspects that could be measured; one such way to assess this is through memory. Cameron and Frieske (1994) introduce the idea of memory latency, which they define as "the length of time that a person takes to remember something". If an individual hears a new narrative with new messages, they are more likely to take longer to respond to questions regarding the new information because it is not familiar to them and they are still processing it. Therefore, the memory latency is going to be longer. If the piece of information is old or something they do not believe, the period of memory latency will shorten since they will be recalling old information.

Hypotheses

Based upon the information already provided through other experiments and the theoretical framework, we will be working with the following hypotheses:

H1: If the story anthropomorphizes the animal, then there will be a larger degree of transportation

H2: If a participant is a high visualizer then they will experience a higher degree of transportation than a low visualizer.

H3: If the participant experiences high amounts of transportation into a narrative, then they are more likely to adopt the narrative beliefs

Methods

Participants:

Sixty-Four undergraduate students at Cornell University served as participants in this study. Participants were drawn from all over campus. There was a mix of communication students, who received extra credit for their participation, as well as students from a variety of different departments and majors. Participants were recruited through the experiment bulletin board as well as through e-mail list serves, personal request, and word of mouth. There were twenty-three men who participated and forty-one women. All participants were between the ages of eighteen and twenty-three.

Materials:

Each participant was asked to listen to a series of eight stories. Four of the stories were fiction and four were non-fiction. The stories all related to animals and were gathered from a number of sources. The fictional stories were all taken from the same website of fables and animal tales. The non-fiction stories were taken from two different

websites (Newman, 2006) (Knaur, 2004). None of the stories were presented in their original forms; each was manipulated to help test our independent variables.

Each story was presented in four different versions. Since the primary independent variables we were interested in were transportation related to the degree of anthropomorphism in the stories, and its effect on the retention of information, two manipulations were done to each story. The first was to change whether the story was anthropomorphic or not. The second was to include either true information or false information about the animals in the story. The anthropomorphism was altered by the addition or removal of human like adjectives. Two versions contained adjectives in them that would depict the animal as more human like and two versions lacked these adjectives. For example, in the "Cartload of Almonds" story, the fox is described as "clever" in two of the stories, but not in the other two.

In each story, two or three pieces of information were selected to be the target facts. In two versions, this information was correct, in the other two versions the information was incorrect. For instance, in the story about wolves, two of the versions said that they travel in small packs, which is true. The other two versions said that they travel in large packs, which is untrue. As a result, each of the stories had the following versions:

- Anthropomorphic with True Information
- Anthropomorphic with False Information
- Non-Anthropomorphic with True Information
- Non-Anthropomorphic with False Information

. Other than the manipulations done, the four versions of the story were identical to one another.

The order of the stories and the version that each participant heard were determined using the Graeco-Latin square. Since there were eight stories, we ran the Graeco-Latin square twice: once with the fictional stories and once with the non-fictional stories. The subsets were ordered forming sixteen different conditions of varying story version and order. The four fictional stories came first in every order, followed by the non-fictional stories. All of the stories were recorded using an mp3 recorder, and were made into mp3 files. The same male voice recorded all of the stories. The stories were then loaded into Medialab (Empirsoft) software designed for presenting experiments and recording participant responses.

In addition to the materials needed for the stories, there was information used for the progressive relaxation technique (Fitzpatrick, 2006) Instead of having the participant lay down and take a half an hour to relax their muscles, we took the basic principle of tensing and relaxing muscles, shortening the exercise to fit within a couple of minutes. Participants were asked to close their eyes and follow verbal instructions. They took three deep breaths, in through their noses, and out through their mouths. They were then instructed to tighten the muscles in their feet as tightly as they could. After a five second count, they were instructed to relax. These instructions were repeated for the calves, thighs, hip and abdominal muscles, shoulders, hands and face, each of which were held for a count of five. They were then asked to take two more deep breaths, in through their noses, and out through their mouths.

All of the subjects were put through the progressive relaxation exercise and then half of the subjects received a visualization exercise. .Those randomly assigned to the visualization were asked to remain with their eyes closed and listen to a story entitled the Peacock and the Tortoise (Tappen, 1914). While the story was read, they were encouraged to visualize the images. They were then asked to continue this visualization after the experiment had begun.

Finally, in between the stories and the questions afterwards, a break was given and subjects were asked to complete a crossword puzzle (Autumn). The crossword puzzle was given in order to distract the participant from what they had just heard. That way, answering the questions later relied more heavily on memory. This puzzle was taken from a teaching website in order to maintain simplicity and not frustrate the subjects.

Before running subjects, the experiment had to be created on media lab. Sixteen total versions of the questionnaire were formulated. Each questionnaire contained one version of the eight stories. After each story, there were the same three questions relating to realism, and one relating to transportation. After the eight stories, there was a screen informing the subject to tell the experimenter they had reached the point in the experiment to take a break. After the break, each questionnaire contained eleven questions regarding transportation (See Table 1) and twenty true/false questions, designed with specific reference to the stories. Two questions were associated with each story and four questions completed unrelated to add variation. After each true false question, there was also a confidence question, which asked the subject how sure they

were of their answer. This question was based on a scale of 1 to 6, with 1 indicating the least confidence and 6 indicating the most.

Measurements

Transportation

Using a similar model to that used in Green and Brock (2000), we measured degree of transportation using a 1-6 scale, with one extreme of "Strong Disagree" and the other extreme of "Strongly Agree". The first items related to general transportation, with statements such as "I was mentally involved in the narrative while reading it".

Effects of Stories on Beliefs

After the subject has listened to each of the stories, they received a series of true/false questions that related specifically to the stories heard, as well as four distracter questions, not pertaining to any of the stories. Each question was followed by a degree of confidence measure, determining how sure the subjects were of their answers. We looked at the answers to these questions, taking into consideration the version of the story the participant heard, and assessed how the stories influenced belief about animals.

Effect of Stories on Attitudes towards animals

There was also a set of questions geared specifically towards the individuals view on the animals themselves. This helped determine the degree to which anthropomorphism affects how the listener perceives animals and their attitudes towards them.

Memory/Recall

The Medialab program recorded that speed of response for each question. This information was used to examine memory recall and relate it to degree of transportation.

This is important because if it takes an individual longer to answer a question, it means they are thinking about it. This indicates that it is not knowledge they know offhand, so they will be more likely to rely on information they gained from the stories. Therefore to help gauge the degree of transportation, we compared the amount of time it took individuals to answer each of the questions.

Procedure:

Participants who entered the experiment were unaware of the nature of the study. They signed up believing it was a study of how people interpret stories. Individuals signed up for half an hour time slots. They were asked to sign a consent form and sit in front of a computer, which was already set up for the condition that the subject had been randomly assigned.

Each subject was then taken through the progressive relaxation technique. Half of the subjects, determined by random assignment, were led through the visualization exercise. They then began the computer-mediated portion of the experiment, but were encouraged to keep visualizing. The non-visualizing participant group began the computer portion of the experiment immediately after the progressive relaxation technique.

As the subjects completed the experiment, I sat on the other side of the room, blocked by a cubicle so as not to be a distraction. When they completed the story portion of the experiment, they were instructed to let me know. At this point, I gave them a crossword puzzle and asked them to work on it for four minutes. I kept time and when four minutes elapsed, I took the puzzle and instructed them to answer the questions

provided and let me know when finished. After they finished the entire experiment, I provided them with a debriefing statement and answered any questions that they had.

Since the entire experiment was done on the media lab program, all of the data was entered as they went along. I also kept careful records on both an excel spreadsheet as well as on the crossword puzzle as to which subject was assigned to which condition.

Results

Based upon our independent variables (visualization, anthropomorphism, fiction/non-fiction and truth) we analyzed an array of dependent variables including realism, transportation and memory.

Visualization

Half of the participants (N=32) were randomly assigned to a visualization exercise in addition to the progressive relaxation technique that all of the participants (N=64) took part in. No significant difference was found in the degree of transportation between those individuals who were given the visualization exercise and those who were not. The mean transportation level for no visualization was 4.02 and the mean transportation level for visualization was 4.05, on a scale of 1 to 6 where 6 indicated the highest level of transportation. (See Figure 1)

General Analysis

Many of the dependent variables were similar to one another and were analyzed in the same or a similar manner. All data was analyzed using the SPSS statistical program. Unless indicated otherwise all analyses were a 2 (anthropomorphic/non-anthropomorphic) x 2 (fiction/non-fiction) x 2 (true information/false information) x visualization condition mixed analysis of variance. Visualization was between subjects;

all other variables were within subjects. In some analysis a media split of the transportation scale was used in place of the visualization variable. Based upon which conditions were viewed by the participants, syntaxes were created aligning the proper dependent variable with the correct condition; in the process new variables were created. These new variables were analyzed using our four independent variables, visualization, anthropomorphism, fiction and truth. The statistics provided allowed us to determine which independent variable had significant effects on the dependent variables and what these relationships were.

The memory questions were analyzed slightly differently. A syntax was created to count up the number of questions each participant answered correctly for each story. This created new variables that were then coded to determine how many questions they should have gotten correct given the condition they viewed. This analysis helped to determine how the conditions of the story affected learning. Similar syntaxes were created for the level of confidence people felt when answering the questions, as well as how long it took them to answer the questions.

Since visualization had no significant effect on transportation, the dependent variables were also run using the degree of transportation as one of the comparison variables. Participants were broken up into two groups in this analysis, those experiencing high transportation (Transportation Scale ≥ 4.0) and those experiencing low transportation (Transportation Scale < 4.0). Not all dependent variables had additional significant affects when compared to transportation.

Realism Analyzed with Visualization

Realism was assessed for each story using three different realism variables. These three dependent variables measured how realistic the stories appeared if they were to happen to the average person (AP realism), if they were to happen to the listener themselves (self-realism), and how realistic they appeared in general (general realism).

If this were to happen to the average person (AP Realism)

This first realism question assessed the participant's concept of realism in relation to other people. One relationship, the interaction truth X visualization, was not significant if alpha = .05; however, it was significant if the criterion was somewhat less stringent, $F(1, 62) = 3.45$ $p = 0.068$, $\eta^2 = .05$.

When participants received the visualization treatment those stories containing true information were judged more likely to happen to the average person (M=3.836 SD=.118). Stories that appeared the least realistic in relation to the average person were those that were heard by the participant undergoing the visualization exercise but contained false information (M=3.555 SD=.114).

If this were to happen to me (Self Realism)

The second realism question assessed how realistic people thought the stories were in relation to themselves. There were several independent variables that influenced this measure. The first was fiction, $F(1, 62) = 6.66$, $p < .05$, $\eta^2 = .110$. This variable indicated that non-fictional stories (M= 3.563, SD= 0.087) appeared more self realistic that fictional stories (M= 3.259 SD= 0.109).

Anthropomorphism X truth, $F(1, 62) = 4.96$, $p < .05$, $\eta^2 = .084$ also had an affect on self-realism. The analysis of this variable was interesting because it showed that the most self-real stories were anthropomorphic and false (M= 3.518 SD=.120) and non-

anthropomorphic and true (M=3.518 SD=.108). The least self-real stories were those that were anthropomorphic and true (M= 3.170 SD=.155)

This appeared very realistic (General Realism)

The final realism question that was asked about each story was a general realism question. The relationship that had a significant affect on this variable was anthropomorphism X fiction, $F(1, 62) = 4.84$, $p < .05$, $\eta^2 = .072$. The results indicated that non-anthropomorphic stories that contained false information (M=3.867 SD=.133) appeared to be the most realistic. Non-anthropomorphic stories containing true information (M=3.406 SD= .130) seemed the least realistic. Stories that were anthropomorphic appeared to received approximately the same realism scoring regardless or whether they contained true information (M=3.570 SD=.139) or false information (M=3.516 SD=.121).

Realism Analyzed with Transportation

The AP Realism and Self Realism variables showed no difference when analyzed with the degree of transportation instead of visualization. The effects on these variables were from the other independent variables. However, the general realism of the stories was affected by the degree of transportation of the participant. An interaction was seen between transportation X fiction X truth, $F(1, 62) = 4.32$, $p < .05$, $\eta^2 = .065$. The data showed that participants who were more highly transported into the stories found non-fictional, false stories to be more realistic (M= 3.972 SD= .172). Participants who were less transported found that non-fictional, true stories (M= 3.589 SD=.190) were the most realistic. (See Table 2)

Transportation

One of the primary interests of the research was to look at how transportation affected individuals learning. To do this we first looked at transportation overall by examining the degree of transportation experienced by participants after each story.

There was one major four way interaction that effected the degree of transportation: anthropomorphism X fictional X truth X visualization, $F(1, 62) = 4.12$, $p < .05$, $\eta^2 = .062$. (See Table 3)

Within this interaction participants who had not visualized were most transported into stories that were non-anthropomorphic, fictional and contained false information ($M = 5.313$ $SD = .174$). These non-visualizers were least transported into stories that were non-anthropomorphic, fictional and contained true information ($M = 4.844$ $SD = .193$). The results were different for participants who had visualized. They were most transported into stories that were non-anthropomorphic, fictional and contained true information ($M = 5.125$ $SD = .193$). They were least transported into stories that were anthropomorphized, fictional and contained true ($M = 4.656$ $SD = .224$) or false information ($M = 4.656$ $SD = .218$).

Memory

We examined memory questions to look at the effects of transportation and learning. We looked at not only how many correct answers each participant got for each of the true false questions, but also how long it took them to answer the questions and how confident they were in their answers.

Effects on correct answers to memory questions

Several independent variables influenced how people answered the memory questions. The first was fiction, $F(1, 62) = 23.59$, $p < .001$, $\eta^2 = .276$. Individuals had an

easier time answering questions correctly when the information was presented to them in fictional stories (M=1.496 SD=.037) than they did remembering the information presented to them in non-fictional stories (M= 1.281 SD= 0.035).

Truth was another independent variable that had an effect, $F(1, 62) = 12.19$, $p \leq .001$, $\eta^2 = .164$. Those participants who heard true statements (M= 1.496 SD= .045) remembered the information and answered more questions correctly than those who heard false information (M= 1.281 SD= .039).

Lastly there was a significant interaction with anthropomorphism X fiction, $F(1, 62) = 8.63$, $p < .01$, $\eta^2 = .122$. This interaction indicated that individuals answered more questions correctly when the information was presented in non-anthropomorphic, fictional stories (M= 1.539 SD= .050). Non-anthropomorphic, non-fictional stories (M=1.164 SD= .049) led to the greatest number of incorrect answers. Stories that were anthropomorphic and fictional (M= 1.453 SD=.055) and anthropomorphic non-fictional (M= 1.398 SD=.056), did have an affect as well, but not to the degree that the other conditions did.

Time to answer questions

The amount of time it took individuals to answer questions was a good indication of how accessible the information was in memory. The one independent variable that had a significant relationship was truth, $F(1, 62) = 16.10$, $p < .001$, $\eta^2 = .206$. When individuals were provided with true facts it took them much less time to answer the questions (M= 4476 millisec. SD= 183 millisec) then it did when they were given false information (M=5283 millisec SD=254 millisec).

Time to answer questions dependent on transportation

The amount of time it took individuals to answer questions was also found to have significant interactions with the degree of transportation experienced by the participant. A four way interaction was seen between anthropomorphism X fiction X truth X transportation, $F(1, 62) = 5.95$, $p < .05$, $\eta^2 = .088$. Transported individuals who saw anthropomorphic, fictional, true stories took the shortest amount of time to answer questions (M= 3896 millisec SD= 373 millisec). However, the transported group that saw non-anthropomorphic, non-fictional, false stories took the longest amount of time to answer the questions (M= 6063 millisec SD= 520 millisec). (See Table 4)

Confidence

The final way learning and memory were evaluated was through the confidence measures after each question. One factor that affected participant's confidence when answering questions was fiction, $F(1, 62) = 26.17$, $p < .001$, $\eta^2 = .297$. Those who saw non-fictional stories (M=3.859 SD=.100) were much more confident in their responses to the questions than those who saw fictional stories (M=3.461 SD=.091).

The second interaction was a three way interaction between anthropomorphism X fiction X visualization, $F(1, 62) = 4.77$, $p < .05$, $\eta^2 = .071$. Those individuals who were most confident in their answers were the ones who had gone through a visualization exercise and encountered non-anthropomorphic non-fictional stories (M= 3.961 SD= .157). The participants who were the least confident were the ones who had not gone through the visualization exercise and had seen anthropomorphic, fictional stories (M= 3.227 SD= .163).

Discussion

This study aims to look at how individuals learn about animals and how transportation and the manipulation of other independent variables affect this learning. By manipulating anthropomorphism, visualization, whether the story was fiction or non-fiction and the truthfulness of the information presented in the story we sought to gain an understanding of how narratives can be used as tools to communicate information and knowledge about animals.

Visualization and Transportation

We start delving into how individuals learn about animals by looking at how transportation impacts the way an individual interprets narratives and gains information from them. Our second hypothesis deals with the manipulation of transportation. The theory is that manipulating transportation should affect the degree to which individuals learn information from a story. To try and manipulate transportation we utilized visualization techniques. The rationalization for this choice comes from the Transportation-Imagery Model which tells us that the more vivid the images are the more easily an individual can become transported (Green & Brock, 2002). Taking participants through a visualization exercise would get them in the mode of creating these vivid images in their minds before the stories even begin. We hypothesized that priming individuals in this way would lead to a higher degree of transportation, resulting from the higher level of mental imaging that would be taking place. This hypothesis was not supported and the data shows that those who experienced the visualization technique and those who did not showed almost identical degrees of transportation, with very little difference at all.

Although this hypothesis is not supported it is important to examine the fact that, regardless of the visualization technique, there is still a degree of transportation experienced by all participants, between a 4 and 5 on a scale of 6. This indicates that there is some factor influencing all participants that increases their degree of transportation. An explanation for this affect is that the progressive relaxation technique, which all participants completed, had an affect on transportation. Perhaps just the relaxation alone is enough to allow individuals to visualize sufficiently and be transported into the stories. An idea for future experiments is to run two groups, one without any relaxation technique, and see how that changes the transportation of the participants.

Factors Influencing Transportation

Since transportation plays a large role in how individuals learn from narrative it is important to look at the independent variables that affect this and consider the relationships between them. After each story one transportation question was asked. When analyzing this information a very complex, four-way interaction appeared between the independent variables.

There are different mediating factors affecting the degree of transportation in the visualization and non-visualization groups. In the non-visualization group the difference lies between true and false information. Non-anthropomorphic, fictional, false stories are the most transportive while non-anthropomorphic, fictional, true stories are the least transportive. It is logical that fictional stories lead to higher degrees of transportation, since they provide more vivid images for the reader. However it is unexpected that false information, which would be less familiar to the participant, is more transportive. An explanation for this is that false information appears more outlandish and interesting.

This makes it easier to imagine the false information than it would be to imagine the true information, which is old and familiar.

Within the visualization group a different trend is seen involving the degree of transportation. In this case the participants are most transported into stories that are non-anthropomorphic, fictional and true. They are least transported into stories that are anthropomorphic, fictional and true. In this subset anthropomorphism is the differentiating factor, but in an unexpected direction. We hypothesized that increasing the degree of anthropomorphism would increase the degree of transportation, but the data showed that the reverse happened.

There are several ways to explain this trend. The first is that the stories did not do an effective job of assigning human-like characteristics, so the narratives were not truly anthropomorphic or non-anthropomorphic. A second possibility is that the idea of animals as human-like is too far outside the realm of what people can identify with, so it served to decrease transportation instead of increase it as originally thought. Overall these findings do not support our hypothesis that the greater the degree of anthropomorphism the higher the degree of transportation.

Aside from transportation, this particular analysis also provides some interesting information about visualization. Although the visualization did not directly affect transportation as previously discussed the differences between these two groups indicate that it did have some affect. Instead of influencing the transportation scale, as originally hypothesized, it instead affected the types of stories individuals were transported into.

Factors Affecting Memory

How much people remembered from the narratives they heard is of interest since it helps to illustrate how the narratives influenced the learning of the participants. Several factors influence how well people remember the information that is presented to them in the stories and how well they are able to later recall it when asked to answer true false questions regarding the information.

One factor that affects memory is fiction. Individuals have an easier time remembering information that is presented to them in fictional stories than they do remembering information that is presented in non-fictional stories. As previously mentioned, fictional stories contain more imagery and as a result have a higher degree of transportation associated with them. This supports our hypothesis that individuals with a higher degree of transportation will more readily accept the beliefs of the story.

Truth is another factor that affects memory. Participants remember true statements more easily than false ones. This is because a true statement, in most cases, is information that is already known by the participants, so they are calling upon previous knowledge. False information is new to the listener and requires greater effort to recall because it has not been processed and stored in memory.

There is also an interaction between anthropomorphism and fiction. Individuals find it easiest to answer questions based on the information presented in stories that are non-anthropomorphic and fictional. They have the most difficult time remembering information in stories that are anthropomorphic and non-fictional. As discussed earlier we see the greatest degree of transportation in stories that are fictional and stories that are non-anthropomorphic, so this once again supports our hypothesis that those individuals

who experienced a higher degree of transportation are more likely to accept the information in the stories as true and have an easier time answering the questions.

The number of correct answers is not the only measure of memory. The amount of time it takes each participant to answer the questions also plays an important role. The longer it takes an individual to answer a question the more effort it is taking them to recall the information needed. This indicates that they are using information from the story, not from facts they already know, since the information from the story is new and not committed to memory. The data shows that truth influences the amount of time it takes to answer questions, with it taking less time to answer questions when true information is presented. This makes sense because stories containing true information would reconfirm the ideas and beliefs that the participants already hold, instead of requiring them to remember or relearn information.

There is also an affect of transportation. Participants with high transportation scores answered questions more quickly. They still answered stories containing true information the fastest, but the fact that transported individuals answered more quickly than their less transported counterparts indicates that transportation plays a role in how individuals learn from animal narratives. We must be careful when generalizing about this effect, however, because transported individuals also answered the most slowly when looking at non-fictional, non-anthropomorphic, false stories. One possible explanation for this may be that these are the stories where the information is most expected to be true. They are the most true to life, realist based depictions of animals. False information would cause the most incongruities and lead the participant to think more about their response.

Realism

Although it is not directly related to our hypotheses we look at realism within the stories and the various ways the independent variables affect the participant's perception of realism. Specifically at the perception of realism in relation to themselves (self-realism), in relation to other people (AP realism) and in general (general realism). Some of the results are intuitive and relatively basic. Stories containing true information have a higher degree of AP Realism. Facts that participants know to be true already would appear more likely to actually take place. Non-fictional stories have higher degrees of self-realism, which is logical considering individuals are more likely to see a real-life situation as more realistic than a fanciful story.

There are some other influences on realism, which are less expected and more interesting. One interaction is between anthropomorphism and truth. In the case of self-realism, non-anthropomorphic, true stories were the most real to the individual, while anthropomorphic, true stories were the least realistic. Given that animals are not usually assigned human-like characteristics, it is logical that they appear less realistic. These results illustrate an impact of anthropomorphism on realism.

With general realism there is a different trend that appears. With this variable truth creates the difference in realism, with stories containing false information being more realistic. An explanation for this is that these stories seem more extraordinary and unusual events seem more likely to occur in real life. Either that or participants are unable to fully distinguish true and false facts, so the effect is arbitrary. However the analysis that is done with transportation instead of visualization shows the same trend, lending support to these results. .

Problems

There were several occurrences throughout the course of the experiment that need to be taken into account when looking at the data. Additionally these considerations should be taken into account if this experiment is replicated. Some of these problems had to do with the design of the experiment itself and some of them had to do with the participants, so therefore the data.

In regards to the experiment itself there were one or two subjects who, after completing the study, informed me that they had difficulty differentiating between the scales on the questions after the stories. Particularly they were unsure of the order of "somewhat disagree" and "disagree", so this confusion may have affected the answer they chose and as a result the data. Another individual said that the stories were read too fast, so they were unable to properly visualize. Although there was only one person who made this comment, it is something to consider in the future. Media lab itself also encountered an occasional problem with sound quality, making the stories difficult to understand. This only happened once to my knowledge.

There were several subjects who missed the screen that asked them to take a break and continued on to the questions immediately after hearing the stories. This may have affected their memory since the information would be fresher in their minds. There was also a day when construction was going on, a distraction, which did not take place on the other days the study was run.

Overall the study ran very smoothly, but there is always room for improvement and these factors should be considered when looking at the data.

Conclusion

This study applied old theories to new contexts. There has previously been very little research done on animal narratives and their affects on readers. We used resources provided by previous studies to investigate how in this case transportation can influence learning. Overall, only one of our three hypotheses was supported. It was found that visualization, at least in this case, had no impact on the degree of transportation in the participant. Additionally, anthropomorphism decreased transportation, not increase it as originally theorized. However, we did see evidence that transportation does increase the degree of adaptation of narrative belief. Although this has been shown for other types of narratives in other studies, we were able to show that it also held true in for animal narratives. This shows that animal narratives can be a useful teaching tool to raise awareness and present information through the media.

References

(2004) 'Releasing Nemo' may harm local fish species. CNN.com. Retrieved September 3, 2006, from http://www.wetwebmedia.com/nemomovie.htm

Associated Press (2006, September 12). Stingrays mutilated after 'Croc Hunter' death: Late TV host's animal charity 'disgusted and disappointed' after rays killed. Retrieved September 12, 2006 from MSNBC Online on the World Wide Web: http://www.msnbc.msn.com/id/14795639/

Autumn. Retrieved February 13, 2007 from Cybersleuth Kids Web site: http://cybersleuth-kids.com/games/crossword/

Barney, E.C., Mintzes, J.J & Yen, C.F. (2005). Assessing knowledge, attitudes, and behavior toward charismatic megafauna: The case of dolphins. *The Journal of Environmental Education*, 36(2), 41-56.

Cameron, G.T. & Frieske, D.A. (1994). The time needed to answer: Measurement of memory response to latency. In Lang, A. (ed.), *Measuring Psychological Responses to Media Messages* (pp 149-164). Hillsdale, NJ: Erlbaum.

Fitzpatrick, L. (2006). Progressive relaxation technique. Retrieved on February 13, 2007 from Relaxation Web site: http://cas.umkc.edu/casww/relaxatn.htm

Gerrig, R.J. (1993). *Experiencing narrative worlds*. New Haven, CT: Yale University Press.

Goble, D.D. (2006). Thinking with animals: New perspectives on anthropomorphism. *Environmental History*, 11(2), 376.

Green, M.C. & Brock, T.C. (2002). In the mind's eye. In M.C. Green, J.J. Strange & T.C. Brock (eds.), *Narrative impact* (pp 315-341). Mahwah, NJ: Erlbaum.

Green, M.C. & Brock, T.C. (2000). The role of transportation in the persuasiveness of public narrative. *Journal of Personality and Social Psychology*, 79(5), 701-721.

Green, M.C., Garst, J. & Brock, T.C. (2004). The power of fiction: Determinants and boundaries. In L.J. Shrum (ed.), *The Psychology of Entertainment Media: Blurring the Lines Between Entertainment and Persuasion* (pp161-177). Mahwah, NJ: Erlbaum.

Green, M.C. (2006). Narratives and cancer communication. *Journal of Communication*, 56, 163-183

Green, M.C. (2000). Transportation into narrative worlds: the role of prior knowledge and perceived realism. *Discourse Processes*, 38(2), 247-266.

Knauer, C. (2004). Dolphins save men from shark. Retrieved October 22, 2006, from The Animal Page Web site: http://www.all-creatures.org/stories/a-dolphins.html

Lang, P. (1984). Cognition in emotion: Concept and action. In C. Izard, J. Kagan, & R. Zajonc (Eds.), *Emotion, Cognition and Behavior.* New York: Cambridge University Press.

Newman, A.A. What's so funny? 7 cool stories about animals' sense of humor. Retrieved October 22, 2006 from National Geographic Kids Web site: http://www.nationalgeographic.com/ngkids/0604/6.html

Sein, M.K., Olfman, L., Bostrom, R.P. & Davis, S.A. (1993). Visualization ability as a predictor of user learning success. *Int. J. Man-Machine Studies*, 39, 599-620.

Serpell, J.A. (2003). Anthropomorphism and anthropomorphic selection- Beyond the "cute response". *Society & Animals*, 11(1), 83-100.

Shapiro, M.A. (1986). Analogies, visualization, and mental processing of science stories. In McLaughlin (ed.) *Communication Yearbook 9* (pp339-355). Beverly Hills, CA: Sage

Sheard, M. & Golby, J. (2006). Effect of psychological skills training program on swimming performance and positive psychological development. *International Journal of Sport and Exercise Psychology,* 4(2), 149-169.

Tappen, E.M., ed. (1914) The peacock and the tortoise. *A history of the world in story, song and art.* Retrieved February 13, 2007 from About: Hinduism Web site: http://hinduism.about.com/library/weekly/extra/bl-talesfromancientindia5.htm

Wynne, C.D.L. (2004, April 8). The perils of anthropomorphism: Consciousness should be ascribed to animals only with extreme caution. *Nature*, 428, 606.

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Table 1: Transportation Scale

Question	Answer Scale
While I was listening to the narrative, I could easily picture the events in it taking place	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
While I was listening to the narrative, activity going on in the room around me was on my mind (R)	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
I found myself thinking of ways the narrative could have turned out differently	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
I could picture myself in the scene of the events described in the narrative	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
The events in the narrative are relevant to my everyday life	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
I was mentally involved in the narrative while listening to it	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
The events in the narrative have changed my life	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
After finishing the narrative, I found it easy to put it out of my mind (R)	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
I wanted to learn how the narrative ended	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
The narrative effected me emotionally	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree
I found my mind wandering while listening to the narrative (R)	1- Strongly Disagree 2- Somewhat Disagree 3-Disagree 4-Agree 5-Somewhat Agree 6-Strongly Agree

Table 2: The Impacts of Transportation, Fiction and Truth on General Realism

Transportation	Fiction	Truth	Mean	Std Error
Low Transportation	Fiction	True Info	3.089	.213
Low Transportation	Fiction	False Info	3.518	.177
Low Transportation	Non-Fiction	True Info	3.589	.190
Low Transportation	Non-Fiction	False Info	3.429	.195
High Transportation	Fiction	True Info	3.653	.188
High Transportation	Fiction	False Info	3.611	.156
High Transportation	Non-Fiction	True Info	3.694	.168
High Transportation	Non- Fiction	False Info	3.972	.172

Table 3: Effects of Independent Variables on Transportation

Visualization	Anthropomorphism	Fictional	Truth	Mean	Std. Error
Visualization	Anthropomorphic	Fiction	True Info	5.516	.224
Visualization	Anthropomorphic	Fiction	False Info	4.906	.218
Visualization	Anthropomorphic	Non-Fiction	True Info	4.906	.232
Visualization	Anthropomorphic	Non-Fiction	False Info	5.063	.206
Visualization	Non-Anthropomorphic	Fiction	True Info	4.844	.193
Visualization	Non-Anthropomorphic	Fiction	False Info	5.313	.174
Visualization	Non-Anthropomorphic	Non-Fiction	True Info	5.031	.184
Visualization	Non-Anthropomorphic	Non-Fiction	False Info	5.031	.187
Non-Visualization	Anthropomorphic	Fiction	True Info	4.656	.224
Non-Visualization	Anthropomorphic	Fiction	False Info	4.656	.218
Non-Visualization	Anthropomorphic	Non-Fiction	True Info	5.000	.232
Non-Visualization	Anthropomorphic	Non-Fiction	False Info	4.719	.206

Non-Visualization	Non-Anthropomorphic	Fiction	True Info	5.125	.193
Non-Visualization	Non-Anthropomorphic	Fiction	False Info	4.875	.174
Non-Visualization	Non-Anthropomorphic	Non-Fiction	True Info	4.938	.184
Non-Visualization	Non-Anthropomorphic	Non-Fiction	False Info	5.094	.187

Table 4: Effects of Transportation, Anthropomorphism, Fiction and Truth on Question Answering Time

Transportation	Anthropomorphism	Fiction	Truth	Mean	Std. Error
Low Transportation	Anthropomorphic	Fiction	True Info	4847	423
Low Transportation	Anthropomorphic	Fiction	False Info	4550	465
Low Transportation	Anthropomorphic	Non-Fiction	True Info	4426	347
Low Transportation	Anthropomorphic	Non-Fiction	False Info	5736	599
Low Transportation	Non-Anthropomorphic	Fiction	True Info	4178	457
Low Transportation	Non-Anthropomorphic	Fiction	False Info	5417	606
Low Transportation	Non-Anthropomorphic	Non-Fiction	True Info	4266	566
Low Transportation	Non-Anthropomorphic	Non-Fiction	False Info	4468	589
High Transportation	Anthropomorphic	Fiction	True Info	3896	373
High Transportation	Anthropomorphic	Fiction	False Info	5820	410
High Transportation	Anthropomorphic	Non-Fiction	True Info	4540	306
High Transportation	Anthropomorphic	Non-Fiction	False Info	5202	528
High Transportation	Non-Anthropomorphic	Fiction	True Info	4894	403
High Transportation	Non-	Fiction	False Info	4797	535

	Anthropomorphic				
High Transportation	Non-Anthropomorphic	Non-Fiction	True Info	4720	499
High Transportation	Non-Anthropomorphic	Non-Fiction	False Info	6063	520

Figure 1: Effects of Visualization on Transportation